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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,172	10/01/2003	Lloyd G. Burrell	FIS920030073US1 (16406)	6804

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EXAMINER	
CHAMBLISS, ALONZO	
ART UNIT	**PAPER NUMBER**
2814	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/676,172	BURRELL ET AL.	
	Examiner	Art Unit	
	Alonzo Chambliss	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-12,21 and 22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-12,21 and 22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/11/06 has been entered.

Response to Arguments

2. Applicant's arguments filed 9/11/06have been fully considered but they are not persuasive.

Applicant alleges that the cited references fail to teach or suggest in any manner " a metallic cap layer that is located on at least the exposed upper surface portion of the wire bond pad and comprise a TiN seed layer with a Ti or Al layer atop ". This argument is deemed unpersuasive because Greer discloses a metallic cap layer that is located on at least the exposed upper surface portion of the wire bond pad 124, 128 and comprise a TiN seed layer 504 with an Al layer 506 atop (see col. 1 lines 5-39, col. 3 lines 1-55, col. 4 lines 14-67, col. 5 lines 20-67, and col. 6 lines 1-51; Figs. 1-6). Nickel is a substitute for Cu as evident by Greer (see col. 4 lines 50-55).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-6, 8, 11, 12, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greer (US 6,451,681) in view of Farnworth et al. (US 2005/0032348).

With respect to Claims 1, 4, 6, 21, and 22, Greer discloses teaches providing a structure 100 having at least one wire bond pad 124, 128 (i.e. made of Al alloy) in contact with a metal line 120 (i.e. made of Cu) of an interconnect structure 100, wherein at least one wire bond pad 124, 128 having an exposed surface portion of layer 126. Copper is a substitute for Al as evident by col. 3 lines 1-5. A metallic cap 508 is on at least the exposed upper surface portion of the wire bond pad 124, 128, wherein metallic cap 508 comprises a TiN seed layer 504 with an Al layer 506 atop and is resistant to

alkaline attack. Nickel is a substitute for Cu as evident by col. 4 lines 50-55. A Ni/Au metallization 602, 604 is formed on the metallic cap, wherein the Ni/Au pad metallization comprises a Ni layer overlaid by an Au layer, wherein the Ni layer is formed by electroless deposition of Ni. A bonding wire 400, 402 can be bonded to the Ni/Au metallization (see col. 1 lines 5-39, col. 3 lines 1-55, col. 4 lines 14-67, col. 5 lines 20-67, and col. 6 lines 1-51; Figs. 1-6). Greer fails to disclose an immersion deposition of Au followed by an electroless deposition of Au. However, Farnworth discloses an immersion deposition of Au followed by an electroless deposition of Au (see paragraph 13). Thus, Greer and Farnworth have substantially the same environment of Au deposited by immersion and electroless deposition. Therefore, one skilled in the art at the time of the invention would readily recognize incorporating an immersion deposition of Au followed by the electroless of Au of Greer, since the combine process would provide a basis for formation of the electroless deposited metal while enhancing the integrity of the wire bonding to bonding pad as taught by Farnworth.

With respect to Claim 2, Greer discloses wherein the metallic cap is formed on the exposed surface portion of the wire bond pad through an opening formed in an overlaying passivation stack 500, 502 (see col. 5 lines 43-59).

With respect to Claim 3, Greer discloses wherein the metallic cap 600 is formed atop an entire surface of a metal layer and then the metallic cap and metal layer are selectively etched to form the metallic cap on at least the exposed upper surface portion of the wire bond pad (see col. 6 lines 15-42).

With respect to Claim 5, Greer discloses wherein the structure further includes a barrier 122 and a lower passivation layer 118 (i.e. ILD interlayer dielectric) formed atop the interconnect structure (see col. 3 lines 12-36).

With respect to Claim 8, Greer discloses wherein the TiN seed a layer of metallic cap has a thickness of about 500 angstroms or less (i.e. 50 nanometers). The Al layer of the metallic cap has a thickness less than about 10000 angstroms (i.e. 900 nanometers = 9000 angstroms) (see 3 lines 49-52, col. 4 lines 5-10, and col. 5 lines 60-67).

With respect to Claim 11, Greer discloses wherein a barrier layer 122 is between at least the metal bond pad and the metal line (see Figs. 1-6).

With respect to Claim 12, Greer discloses wherein the metal bond pad and the metal line are in contact through via opening formed in a lower passivation layer that is located on the interconnect structure (see Figs. 1-6).

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greer (US 6,451,681) and Farnworth et al. (US 2005/0032348) as applied to claims 1 and 8 above, and further in view of Yen (US 4,696,098).

Greer-Farnworth discloses a metallic cap made Ti layer that is cleaned/pretreated prior to forming the Ni/Au (see col. 3 lines 50-67 and col. 4 lines 1-58). Greer-Farnworth both fail to explicitly disclose a metallic cap comprises an Al layer that is cleaned/pretreated prior to forming the Ni/Au. However, it is well known in the semiconductor industry to substitute Ti (titanium) for Al (aluminum) as evident by Yen (see col. 3 lines 39-45). Thus, Greer-Farnworth and Yen have substantially the same

environment of integrated circuit with metallization on the surface of substrate. Therefore, one skilled in the art at the time of invention would readily recognize substituting Ti for Al of Greer-Farnworth, since the Ti metal layer provides a reliable metal for electrical connection for an integrated circuit as taught by Yen.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greer (US 6,451,681) and Farnworth et al. (US 2005/0032348) as applied to claims 1 and 8 above, and further in view of Dobson et al. (US 6,174,823).

With respect to Claim 10, Greer and Farnworth both fail to disclose wherein the Ti layer of the metallic cap is activated prior to forming the Ni/Au metallization. However, Dobson discloses activating a Ti layer prior to depositing another metal layer to the surface of the TiN/Ti layer (see col. 2 lines 53-57, col. 8 lines 54-57, and col. 9 lines 5-14). Thus, Greer-Farnworth and Dobson have substantially the same environment of a barrier layer made of TiN/Ti. Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate activating the Ti layer prior to forming the Ni/Au metallization of Greer-Farnworth, since the activating would improve the bond between the barrier layer and the Ni/Au while creating a strong barrier layer as taught by Dobson.

The prior art made of record and not relied upon is cited primarily to show the process of the instant invention.

Conclusion

7. Any inquiry concerning the communication or earlier communications from the examiner should be directed to Alonzo Chambliss whose telephone number is (571)

272-1927.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-7956

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system Status information for published applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PMR only. For more information about the PMR system see http://pair-dkect.uspto.gov. Should you have questions on access to the Private PMR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or EBC_Support@uspto.gov.

AC/December 14, 2006

Alonzo Chambliss
Primary Patent Examiner
Art Unit 2814